

Cosmological Parameters: SNAP et al.

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CFA

Probing dark energy:

- Amount
- Evolution
- Nature

Probing spatial curvature:

- Is the universe really flat?
- Are we sure?!

How dark energy enters:

We assume that dark energy, like dark matter, interacts only gravitationally. All information is then in

Stress energy tensor : $T^{\mu\nu} + \cancel{S^{\mu\nu}}$

If X is smooth then $T^{\mu\nu}$ is defined by ρ, p or $\rho, P \equiv w$.
By defn these are only a fn of t or z .

Cosmological effects entirely through $H(z)$:

$$H^2 = \frac{8\pi G}{3} [\rho_m + \rho_X + \dots]$$

$$\dot{\rho}_i = -3H(\rho_i + p_i)$$

Classical tests:

$$r(z) : d_A, d_p, d_L, V, \frac{d_A}{d_p}, \dots$$

Structure formation:

$$D(z) : N(>M, z), N(>kT, z), \dots$$

 $P(k, z), \dots$

All integrals of H .
Want finest z
resolution possible.

Constraints from the CMB

Parameters:

IC: $A_s^2, A_T^2, n_s, n_T, n'_s \dots$

Cosmology: $\omega_m, \omega_b, \Omega_k, \Omega_K, \tau, "w"$

$$\Rightarrow h(\omega, \alpha)$$

0th order: Acoustic structure generated @ last scattering, projected onto sky.

Pattern depends on inputs, ω_m, ω_b .

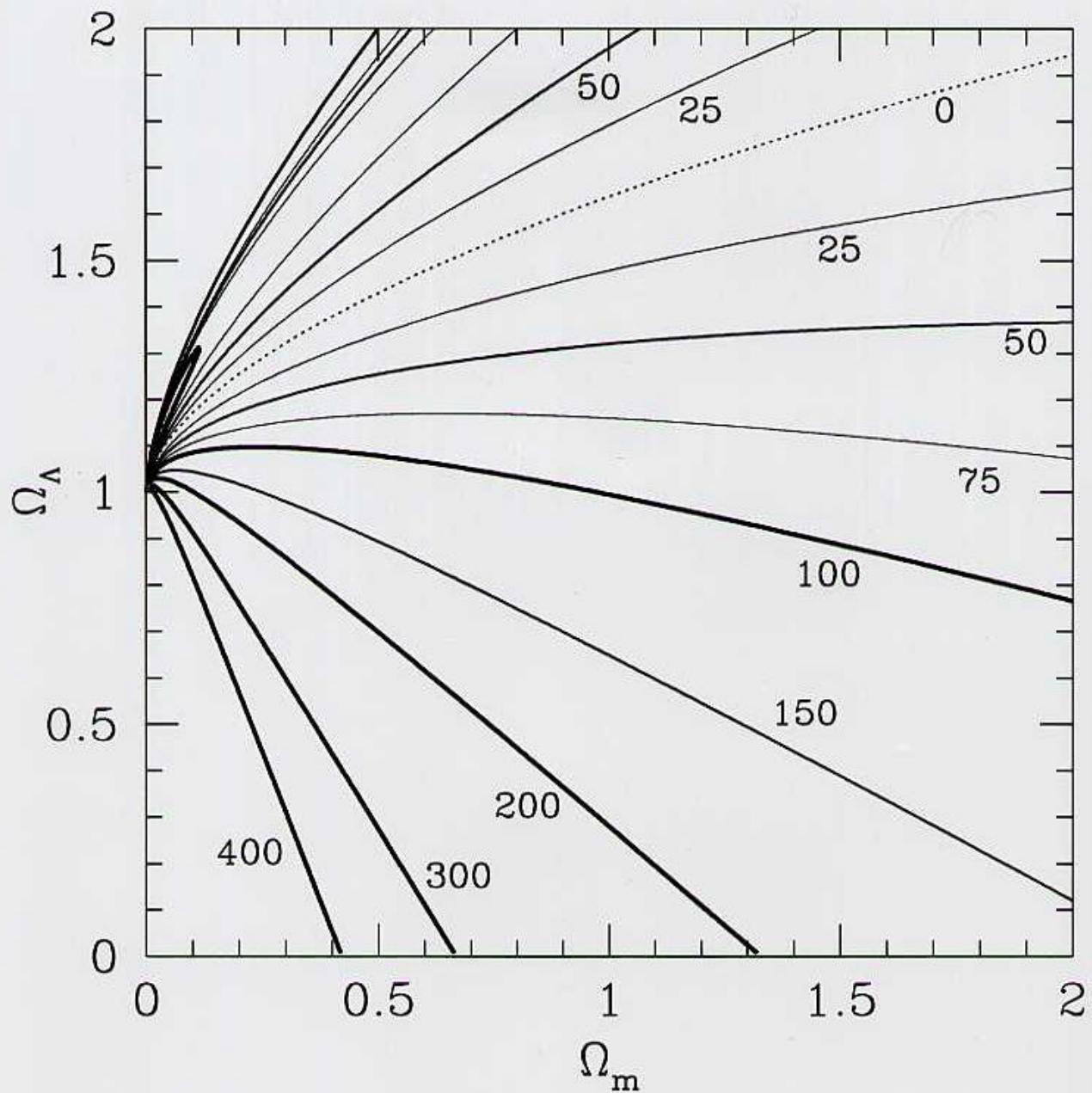
Projection depends on angular distance to l.s.

It is up to higher order effects (ISW, lensing,...) to give further information.

$$e.g. l_{\text{feature}} = k_{\text{feature}} \cdot r$$

\uparrow
 $\eta_0 - \eta_{ls}$
 \uparrow
 $"w", \Omega_k$

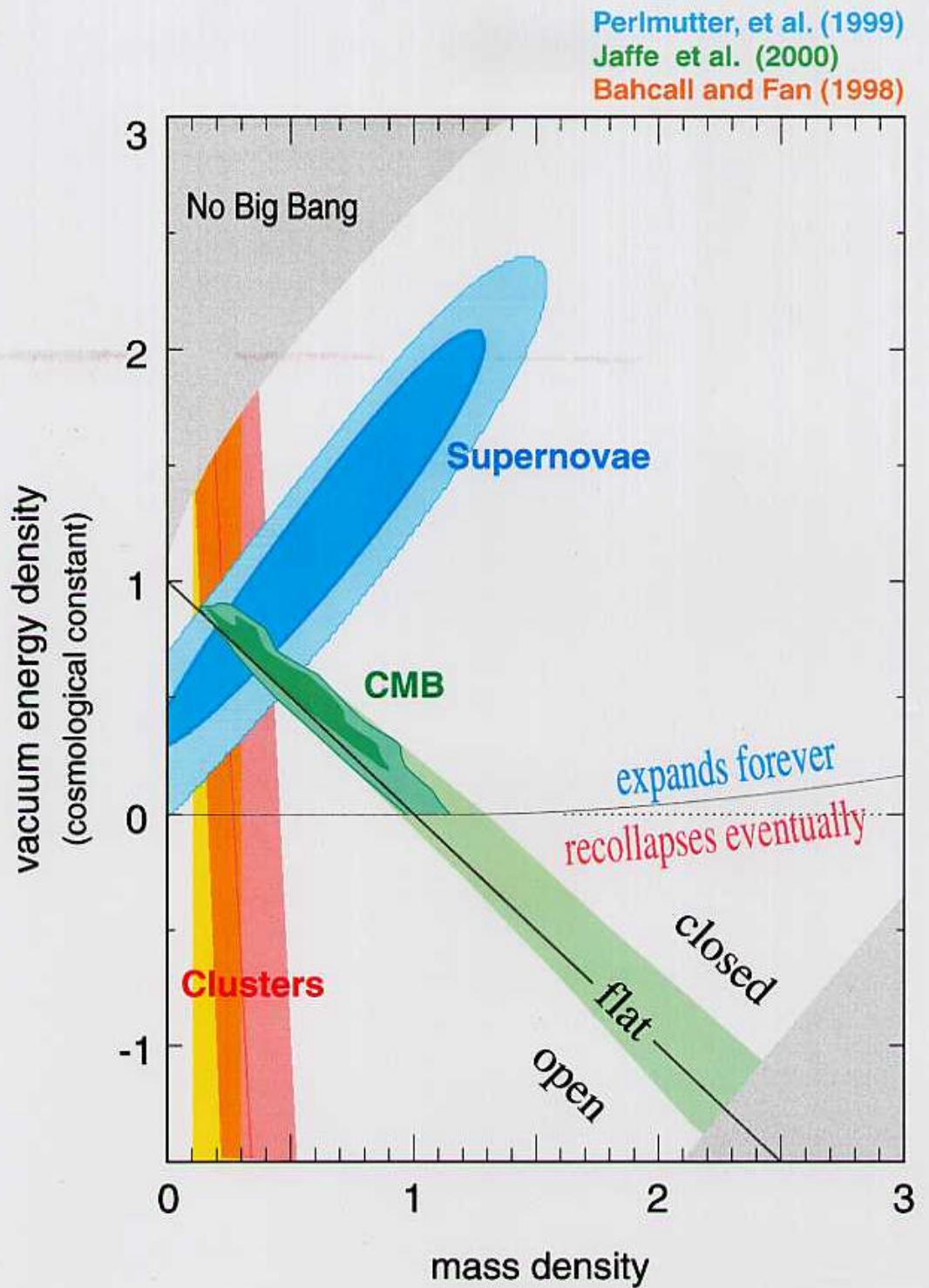
At fixed ω_m, ω_b have degeneracy along lines of constant r (which is very well determined).

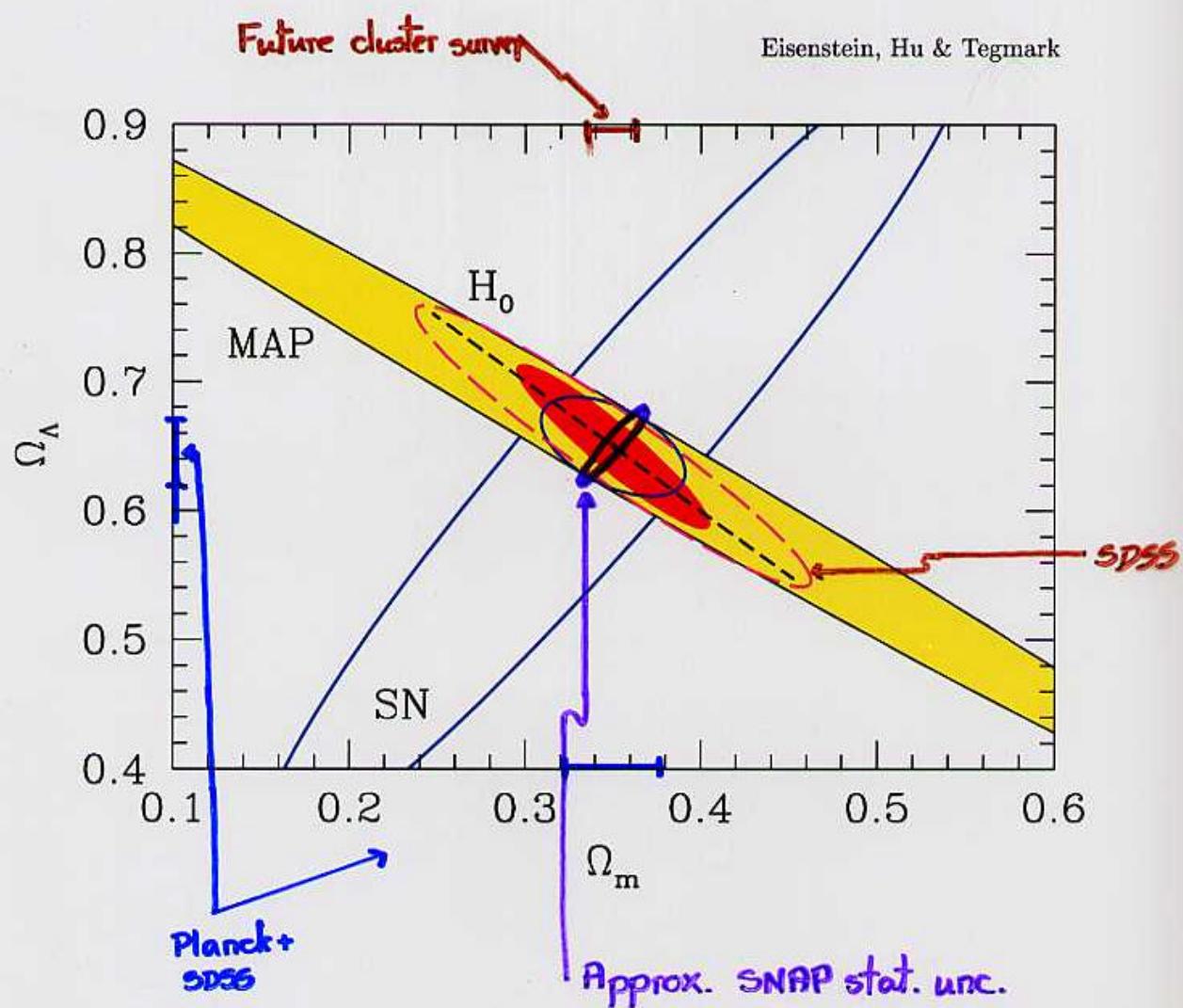


Confusion?

To break this degeneracy we need to ask what changes along this line?

- Ω_m at fixed $h^2 \Omega_m$: so h and Ω_B (but not ω_B)
- Large scale structure e.g. $g(\Omega_m)$, $P(k)$ peak
- Distance redshift relation





Crystal ball gazing...

When SNAP flies, a number of other probes will be available... how well developed and characterized is not clear!

CMB

SNe

Galaxy clusters (Number evolⁿ, CBF, velocities)

Redshift space distortions

Velocity surveys

dN/dv

Weak lensing (2-pt fn, h.o. fn)

Alcock-Paczynski:

- QSO clustering
- P(k) peak
- Ly- α